

THEORY OF ANALYSIS OF SYSTEMS

INPUT

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INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

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D E C E M B E R 1 9 8 8

SERVICE VENDOR ANALYSIS

LARGE SYSTEMS

[illegible]

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1280 Villa Street
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Customer Service Program (CSP)

***Service Vendor Analysis—
Large Systems***

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Abstract

This report, *Service Vendor Analysis—Large Systems*, is the second deliverable in the large-systems module of INPUT's 1988 Customer Service Program. The first report, *Large-Systems Service Analysis*, measured user requirements for and satisfaction with service and support as provided by leading vendors of large systems. The last report in the series, *Service Market Analysis—Large Systems*, will provide a current market size and five-year forecast for large-systems service, and summarize the year's research findings.

The report contains profiles of the service organizations of 7 leading large-systems vendors: Amdahl, CDC, Honeywell Bull, IBM, NAS, NCR, and Unisys. Each profile begins with a short discussion of the company and important service news items from the past year. Next, each profile presents data about the service organization, including revenue totals, employee counts, and office locations, when available. Each profile concludes with a discussion of service delivery, including contract coverage and services provided.

Following these profiles, the report provides summary tables of key service information about the profiled service organizations. These tables will allow quick comparisons between companies analyzed in this study.

The report contains 53 pages, including 16 exhibits.

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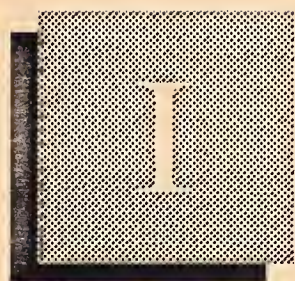
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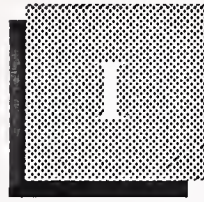


Introduction



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Introduction

This report, *Service Vendor Analysis—Large Systems*, is the second deliverable in the large-systems module of INPUT's 1988 Customer Service Program. The first report, *Large Systems Service Analysis*, measured user requirements for and satisfaction with service and support as provided by leading vendors of large systems. The last report in the series, *Service Market Analysis—Large Systems*, will provide a current market size and five-year forecast for large-systems service, and summarize the year's research findings.

A

Scope

This report contains profiles of the service organizations of seven leading large systems vendors: Amdahl, CDC, Honeywell Bull, IBM, NAS, NCR, and Unisys. Each profile begins with a short discussion of the company and important service news items from the past year. Next, each profile presents data about the service organization, including revenue totals, employee counts, and office locations, when available. Each profile concludes with a discussion of service delivery, including contract coverage and services provided.

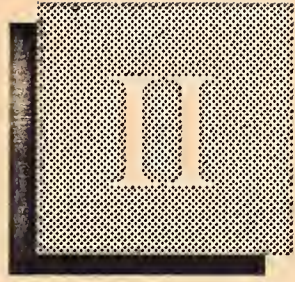
Following these profiles, the report provides summary tables of key service information about the profiled service organizations. These tables will allow quick comparisons between companies analyzed in this study.

Appendixes at the end of this report contain an example of the questionnaire used for this study, as well as a list of definitions used in the report.

B

Methodology

INPUT attempted to survey the companies profiled in this study, using the questionnaire contained in Appendix A. When necessary, INPUT supplemented this effort with information (annual reports, 10K forms, press releases, marketing brochures, and press clippings) contained in INPUT's Information Center, located at INPUT's Mountain View (CA) headquarter's office.



Service Vendor Profiles



COMPANY PROFILE

AMDAHL CORPORATION

1250 East Arques Avenue
Sunnyvale, CA 94088
(408) 746-6000

John E. Lewis, Chairman
Joseph J. Francesconi, Senior VP,
Customer Services
Total Employees: 6,000
Total Revenue, Fiscal Year End
12/31/87: \$1,505 million
Service Revenue: \$270.8 million

The Company

Amdahl Corporation, founded in 1970, is a major supplier of large-scale general-purpose computer systems and related peripherals. The computer products are designed to be architecturally compatible with competing IBM systems; as such, these products are known as plug-compatible. Accordingly, Amdahl's major competitors are IBM and National Advance Systems (NAS) on the mainframe computer side, and IBM, NAS, CDC, and Storage Technology Corporation, among others, on the peripheral side.

Amdahl installed its first mainframe system, the 470 V/6, in June of 1975. In 1988, Amdahl announced a new series of high-performance mainframes, the 5990 series, that are priced between \$7.1 million and \$13.4 million, aimed primarily at airlines, banks, and large brokerage houses with high performance requirements (the largest of the systems boasts over 100 million instructions per second).

Japanese manufacturer Fujitsu, Ltd. owns 45% of Amdahl's common stock and also manufactures the company's DASD, communication control processor, and vector processing products. In the third quarter of 1988, Fujitsu announced plans to import two models of Amdahl's new 5990 series of mainframes. Since Fujitsu's own mainframe products are not compatible with IBM equipment, the Amdahl systems are not expected to compete with Fujitsu's systems for sales.

On the service side, Amdahl lowered maintenance charges between 11 and 23% as of August 1, 1988. These across-the-board price reductions were meant to bring Amdahl maintenance pricing more in line with the competition, particularly in light of significant pricing discounts offered by IBM to CSA customers. Ironically, IBM announced a 3% maintenance price increase in August.

**Service
Demographics**

Total company revenues grew 56% (\$966 million to just over \$1.5 billion) from 1986 to 1987, spurred by extremely high demand for Amdahl's powerful 5890 line of mainframe products, as well as continued sales of the company's popular 6380 storage products. U.S. maintenance revenues growth was only 10% (to \$124.8 million), reflecting increased pricing pressure from users and the competition.

Amdahl offers service out of 54 U.S. service locations and 22 parts locations. Currently, Amdahl employs 856 service employees in the U.S., 410 of which are field engineers and 102 of which are program support specialists. In addition, Amdahl employs 242 technical support specialists to support the field personnel, as well as provide phone support for its customers.

Service Delivery

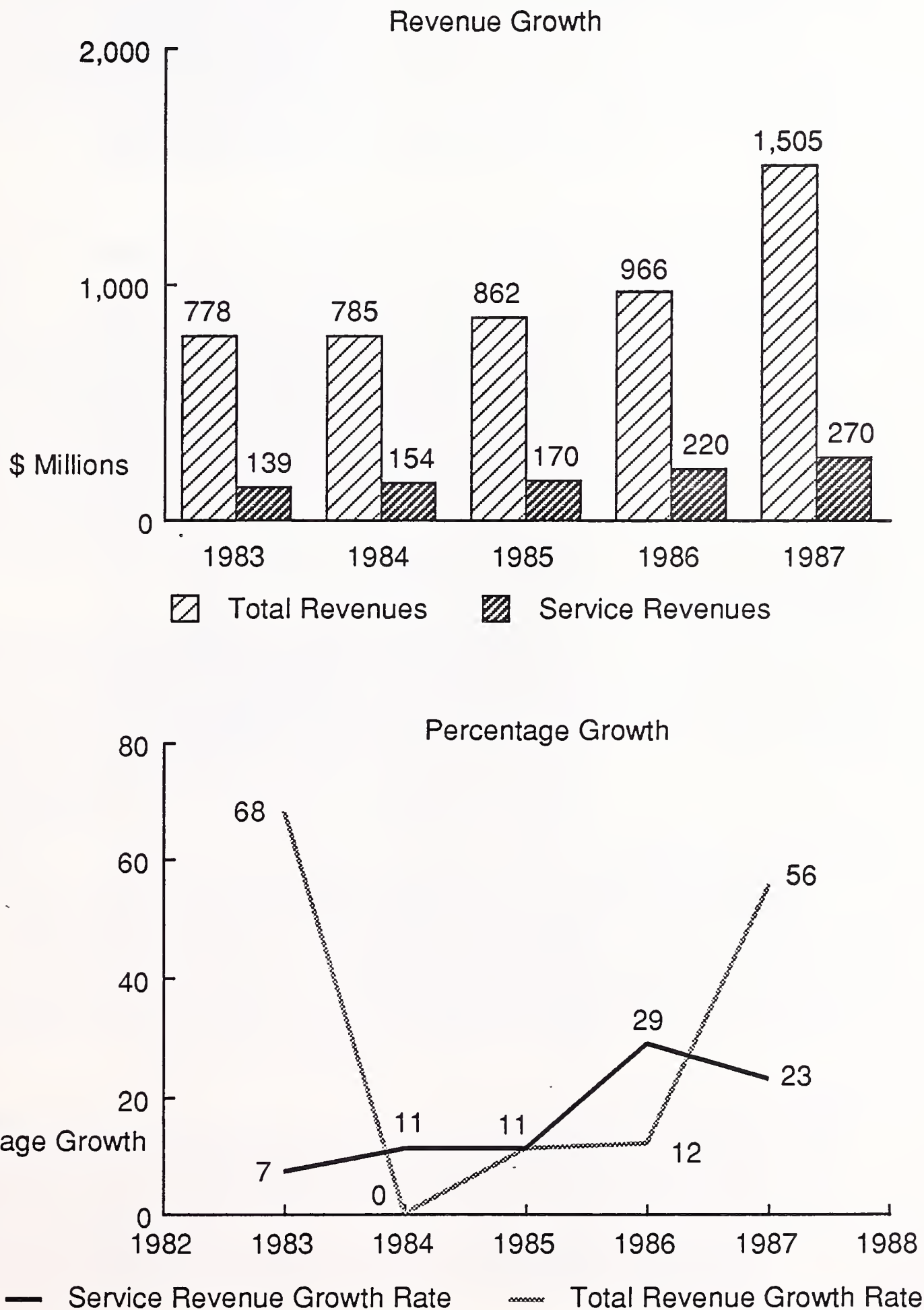
Amdahl provides around-the-clock (24-hour, 7-day-per-week) contractual maintenance coverage to its mainframe and peripheral customers. In case of a system failure, Amdahl users can call a 24-hour, 7-day customer support number (toll-free) to receive phone support, and, if needed, request on-site support. Though Amdahl does not guarantee on-site response times, the company's goal is to meet a one-hour response objective. INPUT user research indicates that Amdahl averages a 1.4-hour response time, satisfying 97% of its users in the process.

Much of Amdahl's support is handled via a worldwide remote support system called AMDAC (Amdahl Diagnostic Assistance Center). All Amdahl equipment is supported by this system. In addition, all Amdahl CPUs contain an integrated control processor that facilitates on-site diagnosis of the system.

Amdahl publishes a diverse catalog of professional and educational support services. Users can go to any of seven regional education centers (located in Columbia, MD; Atlanta, GA; New York City, NY; Rosemont, IL; Houston, TX; Inglewood, CA; and Orange, CA), as well as the national education center in Santa Clara, CA, to receive training on a wide range of operational and performance topics. In addition, Amdahl offers a list of consulting services through this catalog, including systems planning, performance analysis, capacity management, and network management.

Amdahl's Systems Consulting Services Group also offers a wide range of on-site professional services. Amdahl reports that members of its consulting team average 12 years of specialized experience in such areas as network design and planning, performance analysis and system tuning, and storage management.

EXHIBIT II-1

**AMDAHL TOTAL COMPANY AND
SERVICE REVENUE GROWTH**

COMPANY PROFILE

CONTROL DATA CORPORATION

1101 East 78th Street
Bloomington, MN 55420
(612) 851-4416

Robert M. Price, President and CEO
William Fitzgerald, VP, Technical Services
Total Employees: 34,500 *
Service Employees: 4,000 *
Total Revenue, Fiscal Year End
12/31/87: \$3,366,500,000
Service Revenue: \$400 million*

* INPUT estimate

The Company

Control Data Corporation, founded in 1957, manages a diverse set of technically oriented businesses that include Business Services, Computer Systems and Services, Data Storage Products, Government Systems, and Training and Education/Ticketron. The Computer Systems and Services Group supplies large systems and associated services primarily to customers in the scientific and engineering markets. The group is engaged in three key businesses: computers, third-party engineering services, and systems integration.

Revenue increased for the Computer Systems and Services Group in 1987, boosted by the decline in the value of the dollar and a shift from leasing to purchasing systems. During 1987, CDC began shipping the Cyber 930 department-level mainframes, as well as the ETA10 supercomputers. New product start-up costs for ETA Systems contributed to a decline in gross profit percentage for the Computer Systems and Services Group from 1986 to 1987.

Slow mainframe and supercomputer sales continued to trouble CDC in 1988, leading to a week-long idling of five mainframe manufacturing plants in August 1988. Weak sales in the third quarter were attributed to soft demand in the government market and a shortage of semiconductors that has hindered shipment of CDC's new 960 midrange mainframes.

Hardware and software maintenance, as well as systems integration and consulting services, is delivered through CDC's Technical Services Division (formerly the Engineering Services Division), which consists of two integral organizations--Computer Maintenance Services and Professional Services. With profit margins on traditional hardware maintenance squeezed by fierce

competition and with revenue growth in hardware maintenance limited by the increasing reliability of computer equipment, CDC has expanded its customer service offerings in an effort to broaden its revenue base. The 1987 restructuring that broke out professional services from computer maintenance services places CDC in a favorable position to exploit strong growth in the professional services and software support markets. Recent introductions in this area include CDC's Total Operating Performance Package (TOPP), which provides IBM system users with operating system maintenance planning and installation services on IBM system products MVS, VSE, or VM and major subsystems such as CICS, IMS, and VTAM.

Service Demographics

Gross profits declined for CDC's maintenance services business due to increased labor and parts replacement costs, increased pricing and discounting competition, and a shift in its revenue mix, with a greater portion of total revenue attributable to lower-margin maintenance services. Efforts to cut costs led to a significant reduction of personnel in 1987. Approximately 470 employees in administration, engineering, technical, support, clerical, sales, and marketing staffs were let go. INPUT estimates service revenues remained relatively flat at \$400 million.

CDC employs over 4,000 service employees, including over 2,600 field engineers. CDC operates approximately 110 service centers within the U.S. A World Distribution Center manages the parts inventories worldwide. CDC also has purchase, repair, and stocking arrangements with fourth-party suppliers that repair parts and assemblies, as well as purchase arrangements with the original manufacturer.

Service Delivery

CDC provides a single, 24-hour toll-free number for all customers requiring hardware or software support. CDC's Computer Maintenance Services (CMS) organization uses an Incident Management System to dispatch engineers to customer sites. For difficult problems, CMS maintains a Central Support team that provides technical hardware and software support to customer engineers in the field.

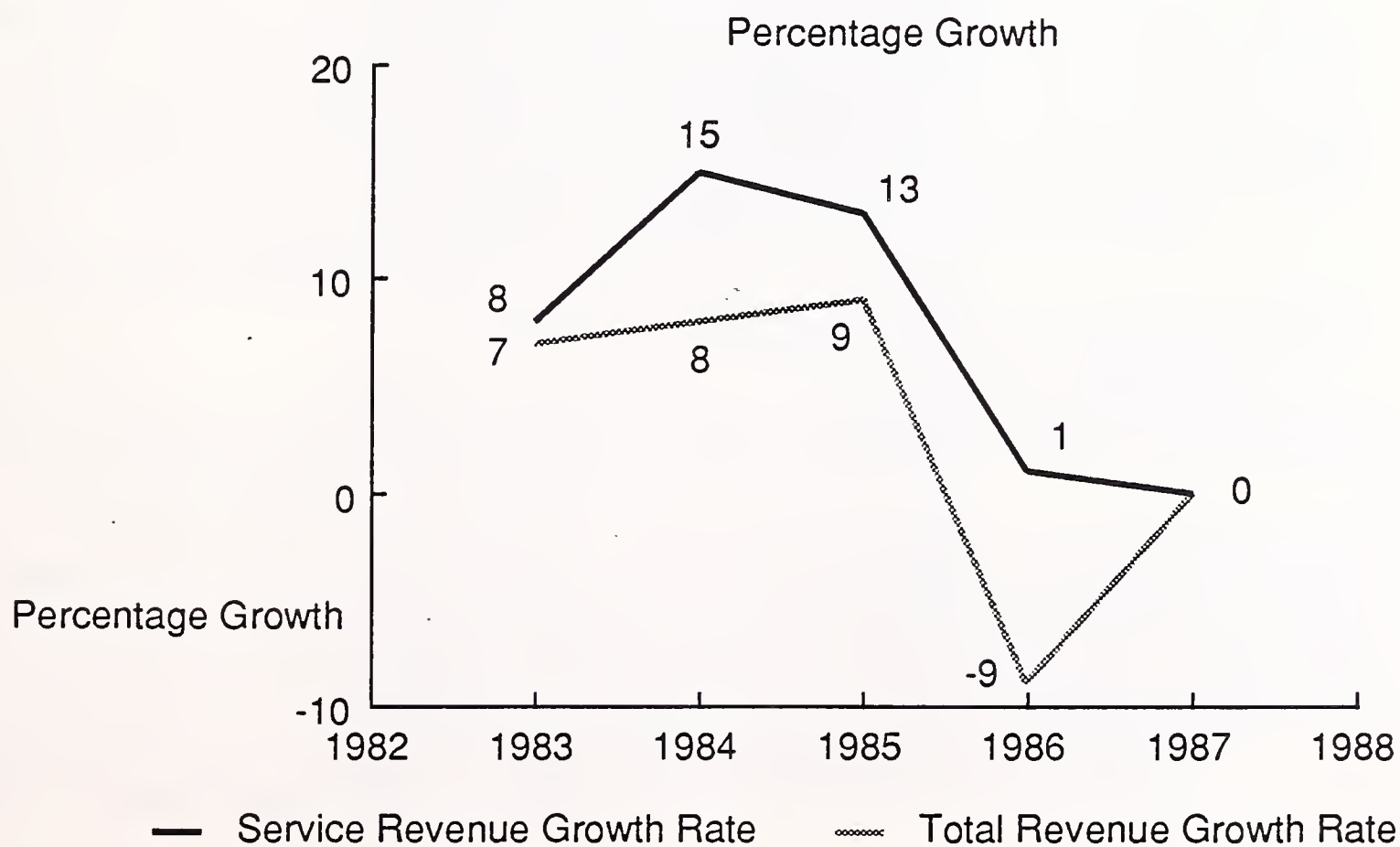
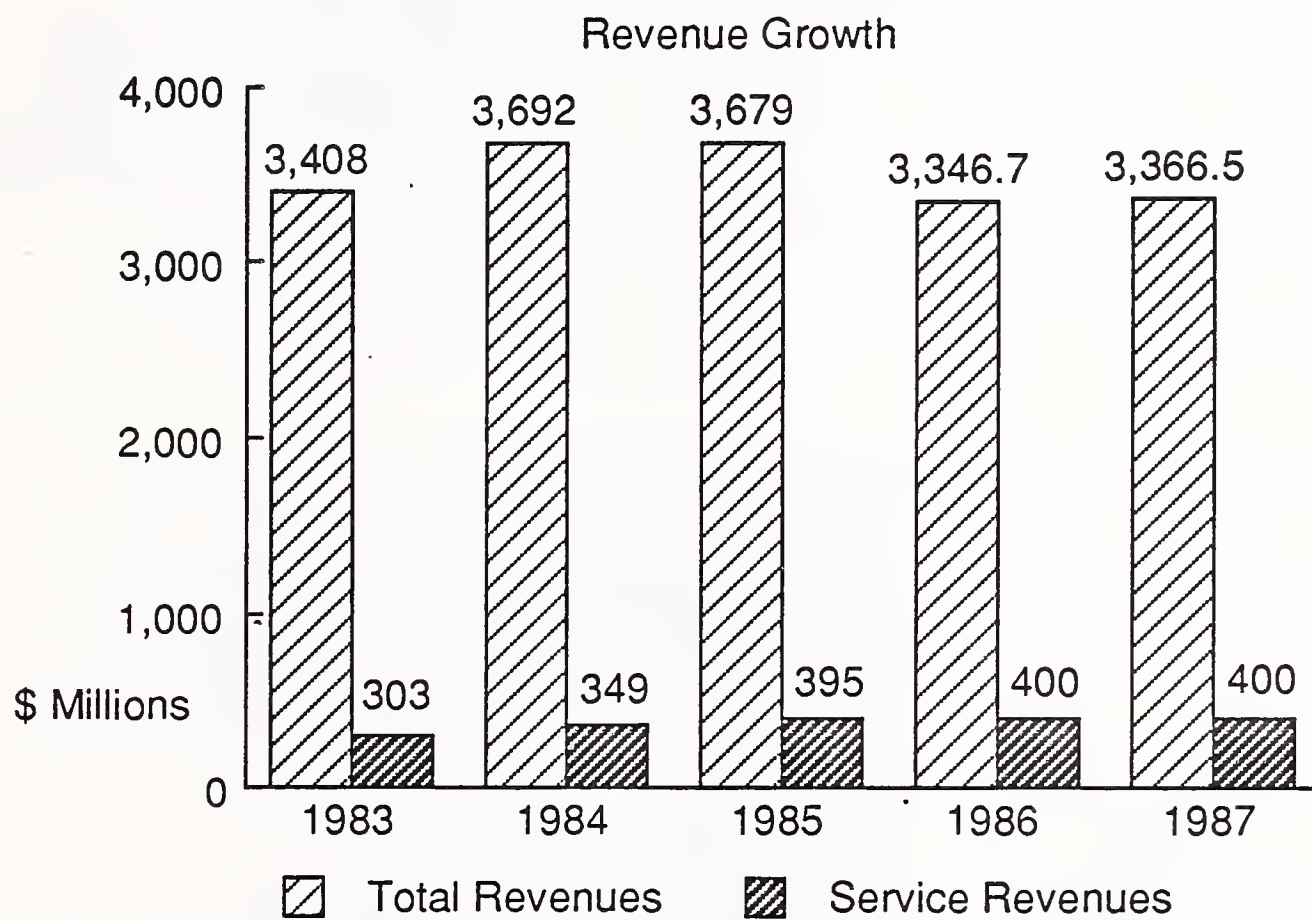
CDC provides 24-hour, 7-day coverage for a wide range of IBM equipment: Series/1, System 303X, System 3X, System 43XX, System 370, System 308X, System 3090, IBM peripherals, and selected non-IBM plug-compatible peripherals and terminals. CDC offers preventive and remedial maintenance; installation, relocation, and deinstallation services; and multivendor

installation management services. An 11-hour, Monday-through-Friday option is also available.

- According to CDC, the equipment is maintained to comply with IBM's specifications for maintenance service. CDC provides the services or covers the charges from the manufacturer to bring the equipment to specified levels. CDC-maintained equipment is certified maintainable by IBM prior to discontinuance of CDC service.

CDC provides 11-hour, Monday-through-Friday coverage--including parts, labor, and travel--for its own line of Cyber equipment. For CDC OEM peripheral products and selected third-party systems, CDC offers a 4-hour response time. CDC will

EXHIBIT II-2

**CDC TOTAL COMPANY AND
SERVICE REVENUE GROWTH**

COMPANY PROFILE

HONEYWELL BULL INC.

141 Needham Street
Newton Highlands, MA 02161
(617) 552-6000

Roland Pampel, President and CEO
Owen F. Keefe, VP Customer Service
Operations

Total Employees: 19,700

Service Employees: 2,800

Total Revenue, Fiscal Year End

12/31/87: \$2,059,000,000

Service Revenue: \$514 million*

* Company estimate

The Company

Honeywell Bull, formed by an alliance forged in early 1987 by Groupe Bull of France, NEC, and Honeywell Inc., is a privately owned information systems company with strengths in networking, data management, and transaction processing. The company is 42.5% owned by Bull, 42.5% owned by Honeywell, and 15% owned by NEC. Bull is expected to increase its holdings to 65.1% in 1989, while Honeywell will reduce its interest to 19.9%. NEC will retain its 15% share.

The synergy formed by this alliance may well have turned around the fortunes of the company formerly known as Honeywell Information Systems. Although profits were nil in 1986 for Honeywell Information Systems, Honeywell Bull posted profits of approximately \$17 million for 1987. In an effort to reduce administrative costs and unneeded production capacity, the company trimmed its workforce by 1,600, eliminating about 1,000 jobs in manufacturing and related support services and cutting 600 positions in marketing, sales, service, and other areas. Plans were underway to add about 250 people in software development, field sales, and field technical support.

Honeywell Bull supplies four families of Honeywell Bull large systems: the DPS 8, comprising approximately 80% of Honeywell Bull's mainframe installation; the DPS 8000, the eventual successor to the DPS 8, introduced and first delivered in 1987; the DPS 88, with price ranging from \$1.85 million to \$3.7 million; and the DPS 90, Honeywell Bull's top-end mainframe computer family. All four large-scale product lines feature modular central-system components that allow for gradual expansion to accommodate growth. Models within each family are hardware- and software-compatible and can be upgraded in the field to a larger system.

**Service
Demographics**

Service revenue for 1987 was \$515 million, a 164% increase over the \$195 million in 1986, when the company was still Honeywell Information Systems.

Honeywell Bull employs 2,800 service employees working out of 163 service locations in the U.S. In addition, Honeywell Bull operates more than a dozen walk-in/mail-in service and support centers. A National Response Center located in Atlanta (GA), accessible 24 hours a day, 7 days a week through a toll-free number, dispatches field service personnel and maintains a problems data base containing the complete equipment service and performance history of every Honeywell Bull customer. Three Technical Assistance Centers (TAC) provide on-line remote diagnostic support for select systems.

Service Delivery

Honeywell Bull offers several support programs:

- Standard Maintenance Service provides 10/5 on-site coverage and includes remedial maintenance, preventive maintenance, and parts replacement. Several extended coverage options are also available.
- The Premium Service Program is available only for large systems and DPS PLUS systems that have maintenance coverage on a 24/7 basis. Service offerings include guaranteed response-time credits, preventive maintenance during scheduled extended maintenance periods, equipment installation, field change order installation, and equipment malfunction protection credit. The guaranteed response-time credit consists of a \$100 credit for each half-hour delay in meeting the 2-hour response time. The equipment malfunction protection credit gives the customer credit, subject to formula and maximum limits, for each hour the equipment is inoperable.
- Honeywell Bull also provides the services of a dedicated field engineer for qualified customers at the rate of \$6,000 per man/shift/month. Weekend rates are charged at an hourly rate per man/shift/month.
- The Customer Assistance Maintenance Program (CAMP) is an optional service that allows the customer to participate in the maintenance process. CAMP is available only for select CAMP equipment that has been designed for this program. Customers may send or bring the part to the nearest service center for repair and may call the National Response Center for

assistance. For certain Honeywell Bull products, the customer may maintain an inventory of spares at the customer's site.

In addition to the above services, Honeywell Bull offers third-party services for equipment from more than 50 manufacturers. These services include on-site maintenance, repair, installation and relocation, manufacturer's warranty, and noncontractual service.

COMPANY PROFILE

INTERNATIONAL BUSINESS MACHINES CORPORATION

Armonk, NY 10504
(914) 765-1900

John Akers, President and CEO
David E. McDowell, President, National
Service Division
Total Employees: 398,348 worldwide
Service Employees: 27,000 (U.S. estimate)
Total Revenue, Fiscal Year End 12/31/87:
\$54.2 billion
Service Revenue: \$7.69 billion

The Company

IBM is a leading provider of information processing equipment and services to all industries. IBM's main product in the large-systems market is the 3090 family of mainframes, with primary competition from the two plug-compatible vendors Amdahl (with its 589X) and National Advanced Systems (with its AS/XL).

On July 26, IBM expanded its 3090 family with the release of the 3090 "S" series of mainframes, which boost the performance of existing 3090 mainframes from 15% (for the Model 150) to 40% (for the Model 600). Still, industry watchdogs point to the next generation of IBM mainframes (code-named "Summit") as the next significant step in the large-system performance wars.

1988 proved to be a pivotal year for IBM in a number of areas. On January 28, IBM announced a major restructuring effort that in effect decentralized authority throughout the organization. IBM set up six new technology businesses under IBM United States. They are: IBM Enterprise Systems (where all of IBM System 370 architecture systems and products are handled, including 309X, 438X, and 937X computers and their associated peripherals and operating systems), IBM Applications Business Systems (responsible for all System 3X and AS/400 computers and their associated peripherals and operating systems), IBM Personal Systems (responsible for all copiers, typewriters, personal computers, and their associated peripherals and operating systems), IBM Technology Products (responsible for semiconductors and technology packaging), IBM Communications Systems (responsible for communications products), and IBM Programming Systems (responsible for SAA and other software development). IBM United States Marketing and Services Group (responsible for marketing and service, including the National Service Division) remains under IBM United States.

Beginning in late 1986 and continuing through 1987, IBM made significant changes in its service pricing and offerings. To win back service customers, IBM offered unprecedented service discounts (the Corporate Service Amendment, the Mid-Range System Amendment), service coverages (extending all systems service coverage to 24-hour, 7-day-per-week), and parts policies (pared down the number of parts centers to 21 nationwide, and instituted new emergency and after-hours parts order charges).

The Corporate Service Amendment warrants further discussion. Announced in October 1986, CSA marked a significant departure from IBM's service pricing and delivery practices. First, CSA represented the most expansive service discount program offered by IBM to date. At the same time, CSA was the first signal that users will need to increase their participation in support in order to continue to get lower support prices along with higher levels of system availability. TPM organizations found it necessary to release competitive offerings, best typified by TRW's Service Plus and CDC's User Friendly Option.

IBM continued to make significant changes in its service direction in 1988 by announcing Technical Services Management (TSM). Recognizing the growing need for comprehensive support for all equipment at a mixed-vendor data processing site, TSM provides three levels of IBM support for non-IBM products at an IBM system user's site (discussed in Service Delivery).

In August, IBM announced a series of product and service price hikes, effective in November. All maintenance agreement rates (including CSA and MRSA) will increase by 3%; T&M rates, installation charges, and system engineering charges will increase 5%. These followed earlier selective price adjustments in February, marking a rare situation when IBM changes price more than once a year.

In September, IBM announced a broad series of telecommunications products and services. The most important (in a service sense) is IBM Telecommunications Services, Network Support. This offering for voice and data communications networks involving both IBM and non-IBM devices provides the customer with network problem determination assistance from problem detection to fix verification from the IBM Network Support Center, which operates around-the-clock. Also, mixed-vendor coordination is offered. In essence, this offering is a TSM-like service offering for users of telecommunications products/services.

IBM's telecommunications support offering includes the skills and services gained by IBM's acquisition of the Spectrum Services division of Pacific Telesis in March. These include advanced network monitoring and diagnostic tools.

Also in 1988, IBM won a court decision when a Philadelphia-based U.S. District Court ruled against upgrade and reconfiguration specialist Allen-Myland, Inc.'s contention that IBM unfairly dominates the large-computer market and unfairly restrained trade (against the Sherman Antitrust Act) by bundling the parts and labor charges into one charge for IBM 308X upgrades and by instituting an installation and warranty service charge (in 1980). Key to IBM's defense was the definition of the large-system "market," which AMI charged IBM unfairly dominated. The court ruled with IBM that smaller computer systems actually competed with IBM 308Xs, contradicting AMI's contention that IBM held up to 79% of the "market." The court also ruled that IBM's thermal conduction module (integral to 308X design and a major cost component) actually made upgrades easier and reduced labor costs.

Service Demographics

IBM's 1987 worldwide maintenance revenues were \$7,691 million, up 3.7% over 1986. U.S. maintenance revenues declined in 1987, falling from \$4,016 million in 1986 to \$3,688 million. IBM attributed the decline in revenues to improved product reliability, a greater proportion of maintenance gross income derived from long-term agreements at lower prices (read CSA and MRSA), and increased competition (from third-party maintenance as well as other manufacturers).

INPUT estimates that IBM employs 27,000 service employees in the U.S., approximately two-thirds of which (18,000) are hardware engineers. These engineers are dispatched out of 233 service locations nationwide.

Service Delivery

All IBM system users receive 24-hour, 7-day-a-week coverage as their standard maintenance coverage. Maintenance agreement holders are assured of around-the-clock availability of IBM spare parts (assured by IBM's Parts Inventory Management System, which tracks spares through two national parts distribution centers, 21 regional distribution centers, 323 branch office locations, and countless parts vans and customer engineer tool kits). Each customer engineer carries a 28-ounce portable terminal that links the CE via digital network to an extensive technical support network that provides dispatching, parts handling, diagnostic, and technical support capabilities.

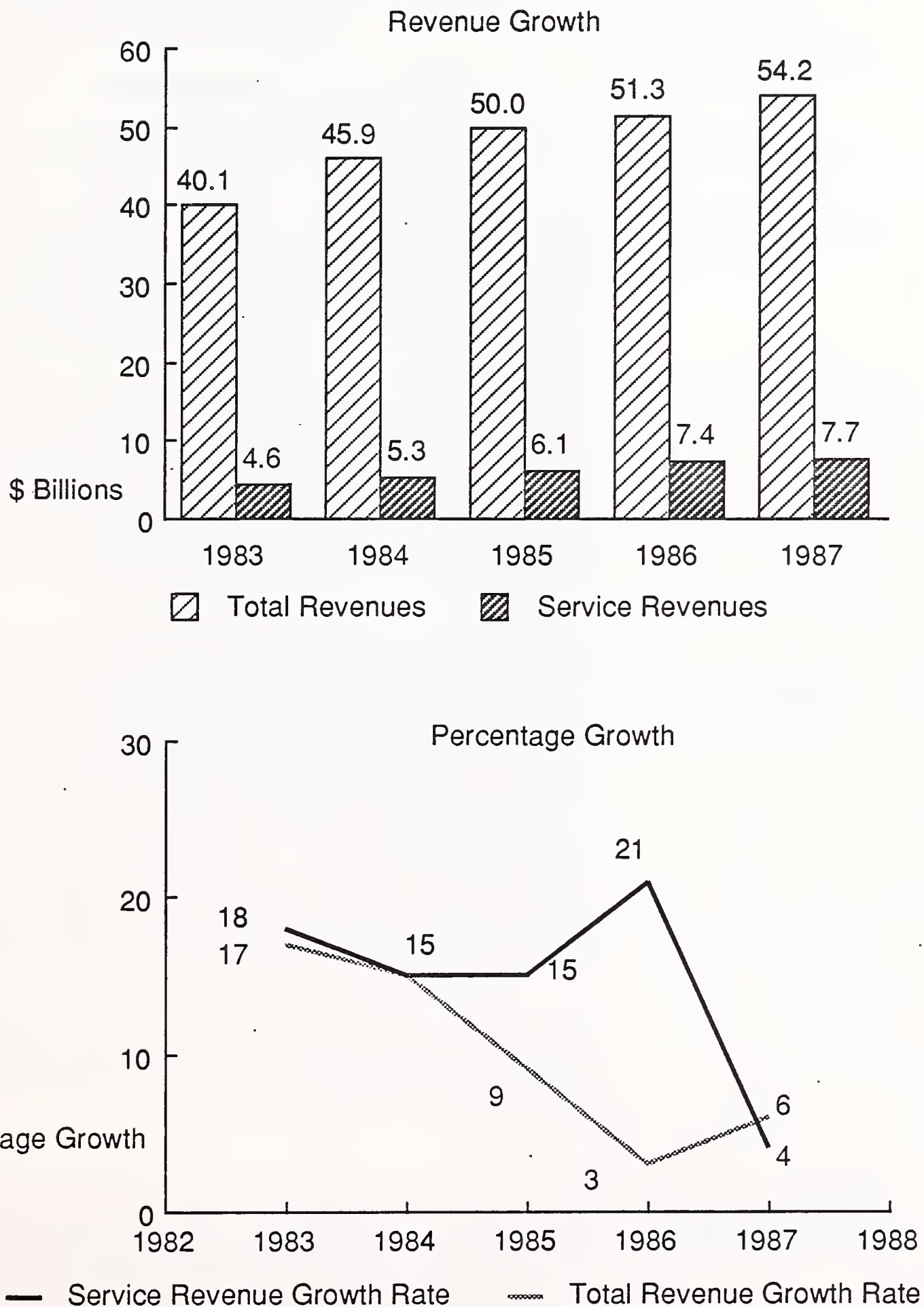
Large-system users can opt for the Corporate System Amendment service plan. Available in three- and five-year contract lengths, the CSA provides discounts of up to 45%. For these discounts, users agree to set up and man a "help desk," which assures that operational problems have been corrected, error recovery procedures have been followed, failures have been clearly identified and logged, and Customer Problem Analysis and Resolution (CPAR) procedures have been performed properly. To qualify, the customer must demonstrate that it has good system management procedures in place. These procedures must cover problem management, change management, and network management.

Another option available to large-system users is Customized Operational Services (COS), a series of site management and planning services that includes site readiness service, contractor services, installation management, cabling, data center evaluation and design consulting, and relocation planning and management services. COS is priced on a case-by-case basis.

In 1988, IBM announced the Technical Services Management service offering, under which IBM provides support for non-IBM products at IBM system sites. Specifically, IBM provides three levels of support under TSM:

- Repair Coordination, where IBM acts as the customer's designated representative in coordinating dispatching, escalation, problem tracking, and service status on all covered non-IBM equipment. Customers continue their service contracts with the other service vendor. Pricing for Repair Coordination (as well as all TSM options) is priced on a case-by-case basis.
- Maintenance Coordination, where IBM plans and coordinates scheduled (i.e., preventive) maintenance visits as well as remedial service calls (covered under Repair Coordination).
- Service Management, the most expansive of the TSM options, where IBM takes full responsibility for OEM maintenance. IBM has the option of performing the service or subcontracting it out to selected service vendors. IBM takes responsibility for service vendor identification, contract negotiation and administration, and invoice reconciliation. IBM will consolidate all maintenance charges and present the user with a single monthly bill. TSM customers who opt for Service Management automatically receive Repair Management. Maintenance Coordination is optional.

EXHIBIT II-3

**IBM'S TOTAL COMPANY AND
SERVICE REVENUE GROWTH**

COMPANY PROFILE

NATIONAL ADVANCED SYSTEMS

750 Central Expressway
P.O. Box 54996
Santa Clara, CA 95054
(408) 970-1000

David N. Martin, President
Al Mascha, VP Customer Service
Total Revenue, Fiscal Year End
5/31/87: \$700,000,000*
Service Revenue: \$170 million*

* INPUT estimate

The Company

National Advanced Systems, officially formed as a wholly owned subsidiary of National Semiconductor in 1977, markets, services, and supports medium- and large-scale IBM-compatible mainframe computers and certain peripheral equipment manufactured by Hitachi, Ltd.

NAS operates as part of National Semiconductor's Information Systems Group (ISG), which also includes the Datachecker Systems division. Datachecker designs, manufactures, markets, and services electronic terminals for retail businesses. Products range from electronic cash registers to point-of-sale (POS) terminals.

Information Systems Group sales enjoyed a healthy 39% increase in 1987, growing from \$640.3 million to \$891 million. Much of this growth was attributed to a dramatic increase in sales at NAS, which, according to NAS, was a result of several developments: favorable acceptance of the Alliance Generation of mainframes and peripherals, which began shipping in 1986 and surpassed NAS' sales expectations in 1987; NAS' expansion into the engineering/scientific market with the new AS/XL Vector Series mainframes and software; and the establishment of a software development center in Atlanta (GA), which develops and vectorizes software for the engineering/scientific market.

SPECTRUM, introduced in 1986, provides third-party installation, maintenance, service, and support functions for OEMs, resellers, and end users.

Service Demographics

NAS employs approximately 950 service personnel, including 500 field engineers working out of 120 service locations within the U.S. INPUT estimates that NAS Customer Service and Support contributed approximately \$170 million in service revenues.

The NAS Customer Support Center, located in San Diego (CA), provides around-the-clock hardware and software support to both customers and NAS personnel. NAS maintains an Education Center for hardware and software training, a Repair Facility, and an East Coast Technical Support group in Lanham (MD). A Corporate Resource Center, located in San Jose (CA), supports NAS' nationwide logistics network.

Service Delivery

NAS provides the following services: hardware and software support, centralized dispatch system, systems programming, consulting, education, around-the-clock access to the Customer Support Center, corporate resource center, worldwide logistics network, product performance tracking system, on-line equipment service reporting system, service management of complex environments, capacity management, and systems contract services.

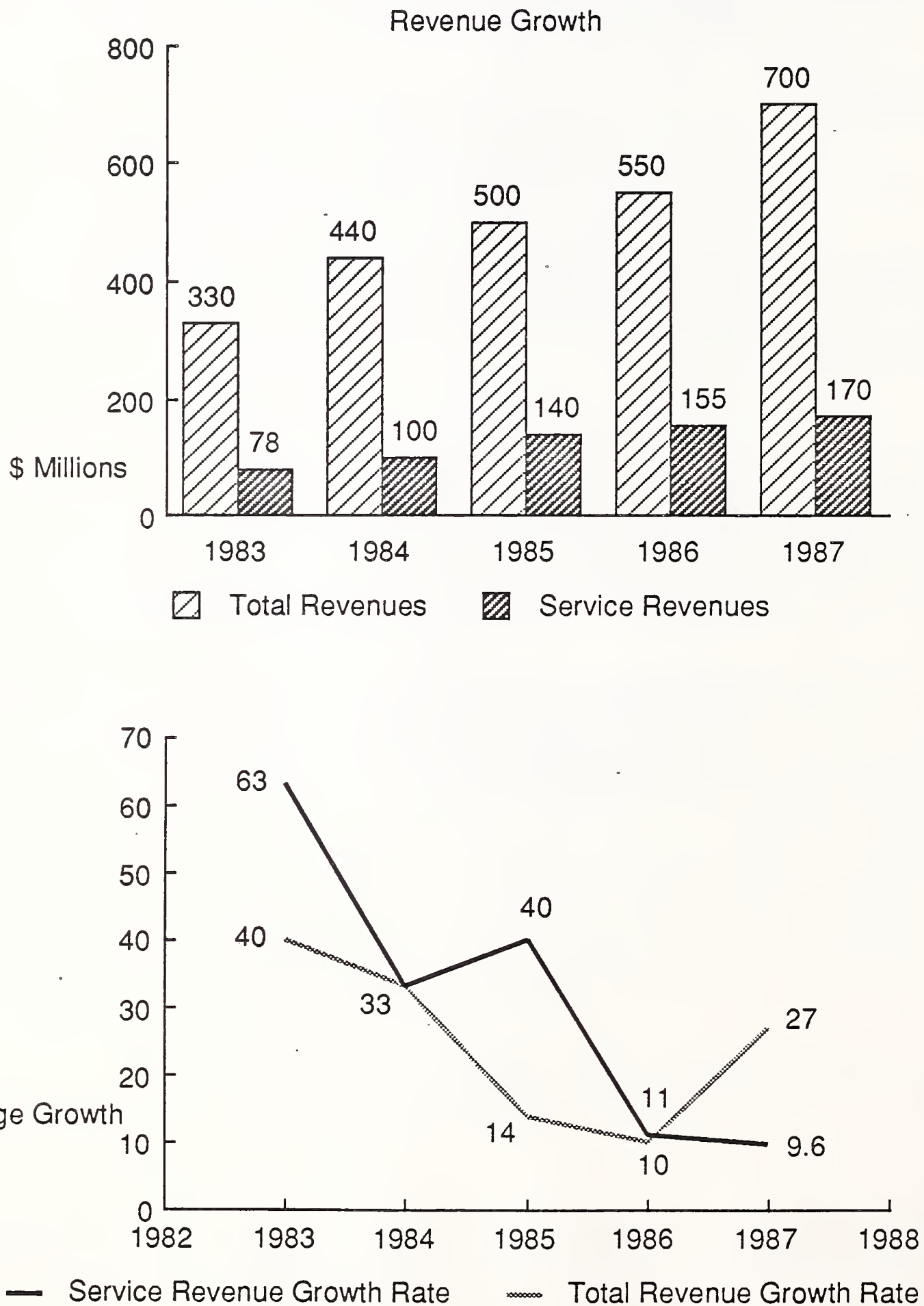
NAS offers a standard 24-hour-a-day, 7-day-a-week maintenance contract with a response time of two hours. Guaranteed response times are an available option.

NAS optimizes physical and configuration planning using computer-aided design tools. Customers can contract for NAS' CAD services, choosing other options such as planning for security systems, power and water runs, and telecommunications networks.

NAS offers Prime Vendor Management, whereby NAS not only resolves problems with its equipment, but works with customer service representatives from other companies to diagnose the source of equipment problems.

EXHIBIT II-4

NAS TOTAL COMPANY AND SERVICE REVENUE GROWTH



COMPANY PROFILE

NCR CORPORATION

1700 South Patterson Boulevard
Dayton, OH 45479
(513) 445-5000

Charles E. Exley, Jr., CEO
Richard Reese, VP Customer
Services
Total Employees: 62,000
Service Employees: 20,000
Total Revenue, Fiscal Year End
12/31/87: \$5,641,000,000
Service Revenue: \$1.952 billion

The Company

NCR Corporation, founded in 1884 as National Cash Register Corporation, currently develops, manufactures, markets, installs, and services business information processing systems for worldwide markets. NCR products and services are grouped in the following categories: industry-specific workstations, general-purpose workstations, multiuser computer systems, large computer systems, communications processors, and synergistic products and services including semiconductors, data centers, field engineering, software services, education, business form and supplies, and financing.

NCR continues to expand the definition of customer services by offering enhanced service options, such as consulting, systems integration, and network support. NCR launched its System Integration unit in May 1988. Operating under the Product Marketing and Support division, the new unit will concentrate on the financial services and retail industries and in the future may target the manufacturing, education, and government markets.

The company has been active in increasing its presence in the third-party maintenance market, signing agreements with Convergent, Chrysler Motor Corporation, and Digital Controls, among others. NCR, which entered in 1983, now services an extensive list of over 700 products from over 100 manufacturers. NCR derives between \$48 and \$50 million in TPM revenues.

In late 1987, NCR's Worldwide Service Parts Center in Peachtree City (GA) began offering reconditioning and repair services on industry-standard equipment from more than 50 computer component manufacturers. The Georgia facility joins two other field engineer service centers (in Bethlehem, PA and Reno, NV) in providing third-party services.

Also in late 1987, NCR acquired the printer group of the Datagraphix division of Anacomp. Datagraphix, based in San Diego (CA), supplies computer output micrographic equipment and markets and services a line of high-speed laser and ion-deposition printers. The printer unit, with its 112 employees, was integrated into NCR's Customer Services Division, bringing new business opportunities in printer maintenance to NCR.

Large-systems revenue increased by 15% in 1987, compared with a 12% decline in 1986 and a 6% decline in 1985. The reversal from the two previous years was due to delivery of the new-generation NCR 9800 systems, which, according to NCR, showed good growth. The revenue increase was attributable to healthy growth in international operation even as large computer systems revenue from U.S. operations declined. Revenue from communication processors remained stable in 1987 after a decrease of 24% in 1986 and a 2% increase in 1985.

Service Demographics

NCR's service revenue for 1987 totaled \$1.9 billion, a 13% increase from 1986 service revenue of \$1.7 billion. This figure includes revenues from hardware and software maintenance, custom programming services, and data processing services. Service revenue for 1987 represents 34.6% of NCR's total revenue, as compared with 35.3% of total revenue in 1986. The increase in 1987's revenue was attributed to gains in international operations, particularly in software maintenance and third-party maintenance, as well as by data processing services in the U.S.

NCR employs approximately 6,000 field engineers working out of 400 service locations within the U.S. NCR also operates 114 repair and exchange centers as well as five parts distribution centers within the U.S. NCR's service network is made up of 15 regions, with an average of seven districts per region. These districts are segmented into zones covered by field engineers who specialize in a particular product line, such as retail or financial systems.

The Worldwide Service Parts Center (WSPC) in Peachtree City (GA) is the main ordering, stocking, and control center for service parts for all NCR customer service organizations worldwide. WSPC maintains an on-line real-time inventory system covering 230,000 different parts. WSPC actively manages 90,000 different parts and ships an average of 5,000 domestic and international orders per day.

Service Delivery

NCR delivers the following services: manufacturer's warranty, hardware maintenance, software maintenance, education and training, installation and relocation, fourth-party maintenance, conversions and upgrades, and refurbishment.

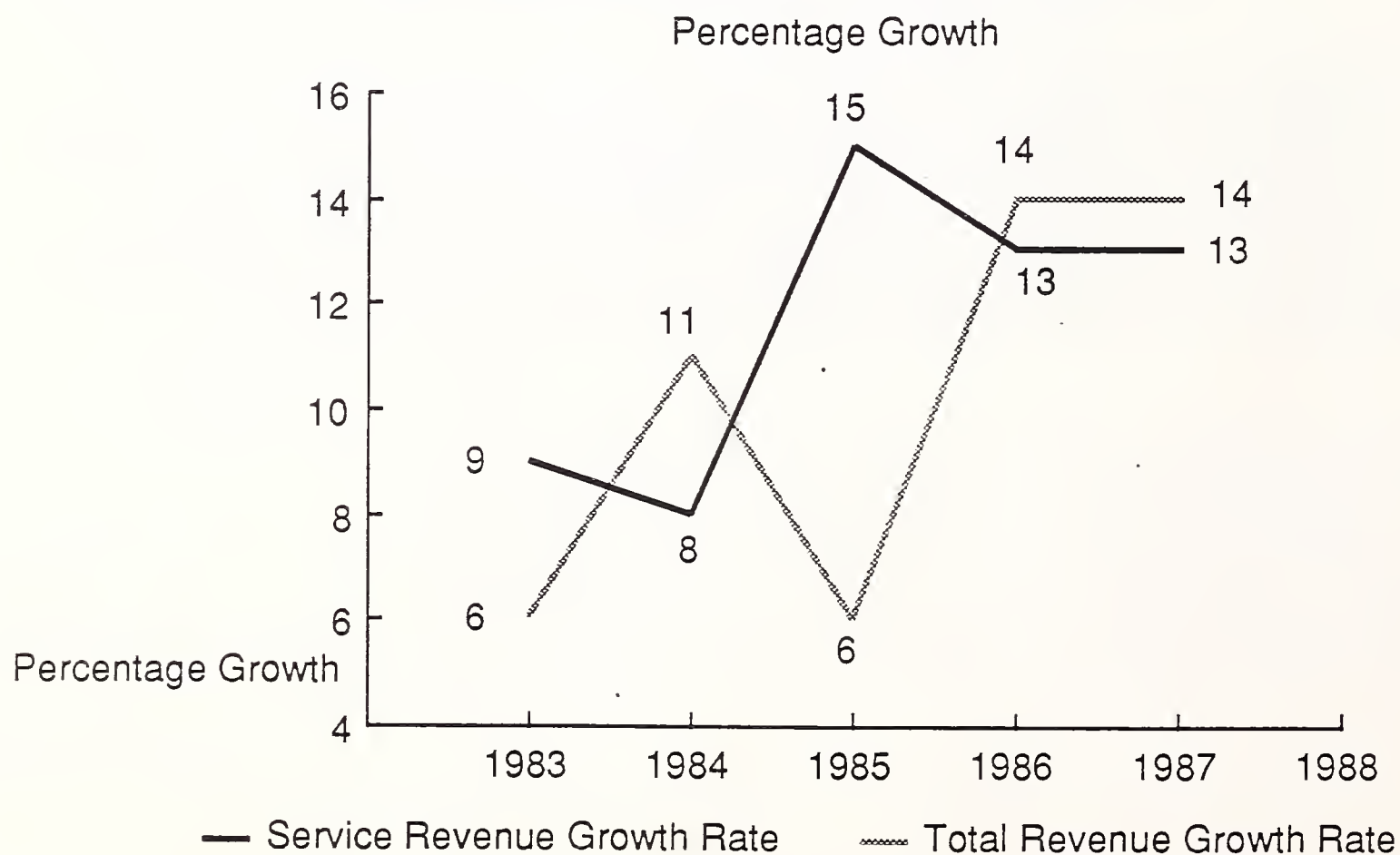
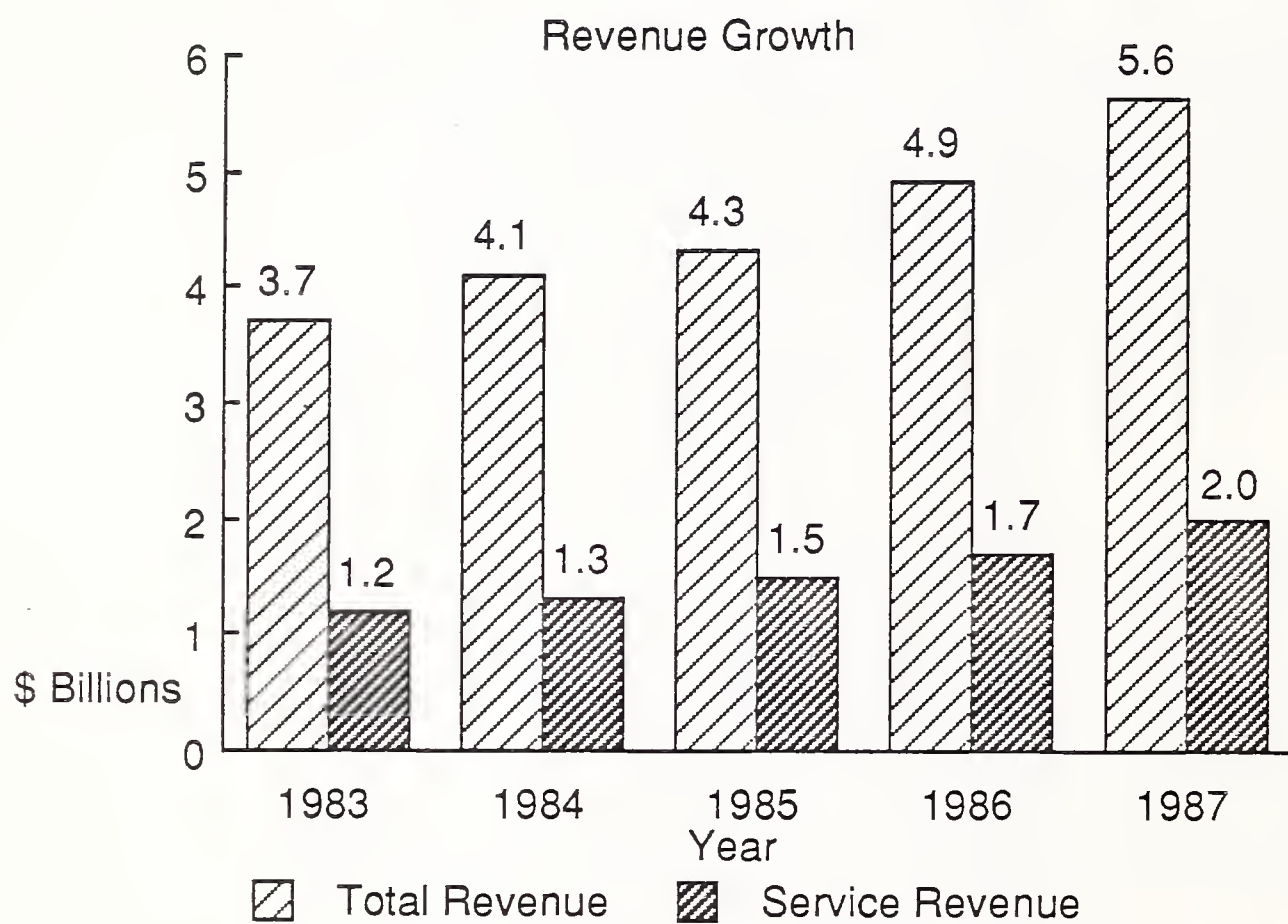
Standard hardware maintenance offerings include both 24/7 and 9/5 on-site coverage, with the length of the principal period of maintenance depending on the product covered by the agreement. NCR guarantees response times of 4 hours for micros and workstations, 2 to 4 hours for midrange systems, and 2 hours for large systems. Discounts are available for multiyear agreements, prepayment of maintenance fees, carry-in service, call screening, performance, deferred response, and remote support. Both dollar and unit volume discounts are also available.

NCR offers remote support services, combining telephone communication and problem lead through with remote diagnostics. NCR provides a single point of contact for hardware-, software-, or firmware-related problems, a convenience since the growing complexity of computer systems has made diagnosis of the problem source difficult for the customer. NCR has the capability to load firmware enhancements to the customer's system from its Central Support office. NCR also provides regularly scheduled preventive maintenance checks for certain NCR systems, using the Expert Systems Preventive Maintenance (ESPM) remote diagnostic tool. If ESPM detects any potential problem with the customer's system, the error logs are automatically sent to the NCR Remote Support Center, which then analyzes the log and proposes solutions.

NCR boasts that its training facility, the Central Technical Education Center (CTEC) in Dayton (OH), conducts over 100,000 days of training for both NCR and customer personnel per year. In addition, NCR operates Customer and Support Education (CASE) facilities at Sugar Camp in Dayton, and provides regional training facilities at NCR offices throughout the U.S.

EXHIBIT II-5

NCR CORPORATION'S TOTAL COMPANY AND SERVICE REVENUE GROWTH



COMPANY PROFILE

UNISYS CORPORATION

P.O. Box 418
Detroit, MI 48232
(303) 972-7000

W. Michael Blumenthal, Chairman
Vincent M. Donovan, President, Customer
Services Operations
Total Employees: 92,500
Total Revenue, Fiscal Year End
12/31/87: \$9,712,900,000
Service Revenue \$2.2 billion

The Company

Unisys Corporation was formed in September 1986, when Burroughs acquired Sperry for \$4.8 billion. The resulting company (the name resulted from a in-house name contest) became one of the largest manufacturers of data processing equipment, behind only IBM (\$51 billion in 1987) and Digital Equipment Corporation (\$10.4 billion) in data processing revenues, with \$8.7 billion.

The acquisition presented a monumental challenge of providing a single company direction and focus while continuing to sell and support two separate product architectures (the Burroughs and Sperry product lines). While Unisys continues to try to bridge the two architectures through communications links and the use of common software (e.g., fourth-generation languages), Unisys has maintained that each product architecture will be maintained "forever and a day."

Unisys has demonstrated this by announcing product enhancements for both the (Burroughs) A Series and the (Sperry) 2200 product line (the latter an upgrade path for Sperry 1100 computers). The 2200 product line featured maintenance and diagnostic systems that run continuously in parallel with normal systems operations, monitoring all systems states and logging any errors. In addition, the remote diagnostics are capable of identifying system failure to the field-replaceable unit (FRU) level, facilitating component exchange.

Service Demographics

Total worldwide service and rental revenues accounted for \$3.3 billion in 1987, up 44% from 1986's total of \$2.3 billion. The U.S. total from service was just over \$1.1 billion, which represented only a 1% growth over 1986. This reflects the increased pressures in remaining competitive in the U.S. service market.

Unisys employs 15,000 service employees worldwide, 7,687 of which are located in 240 U.S. service locations. In addition, Unisys offers carry-in and mail-in service out of 100 U.S. repair centers.

Spare parts are handled at Unisys' Worldwide Distribution Center, located in Chicago. Unisys has a highly sophisticated parts handling and inventory system that monitors more than 145,000 separate part numbers to assure their accessibility. In addition, Unisys maintains a separate International Distribution Center in Sassenheim, The Netherlands.

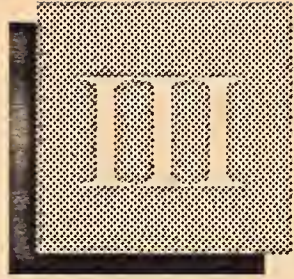
Service Delivery

Unisys offers a wide range of services under contract coverage, including hardware maintenance, software support, operational training, installation/relocation, conversions/upgrades, and professional services. The normal service contract calls for 9-hour, 5-day-per-week service coverage. Unisys does not guarantee response times, but reports a response time objective of 2 hours (for large systems) and 4 hours (for anything else). INPUT's 1988 large-system user research indicates that Unisys more than meets this response time objective, averaging around 1.6 hours.

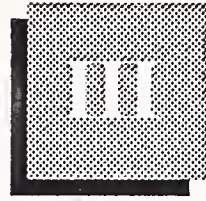
Unisys customers can call a toll-free, 24-hour Customer Support center to request hardware maintenance. Unisys also offers software support through these centers, usually in the form of telephone support.

In addition, Unisys offers a wide range of professional services, including system planning, performance optimization services, and a series of consulting services that Unisys calls Professional Project Practices (PPP).

Unisys offers nearly 900 different training courses, ranging from system operation to executive courses on business communications. Customers can choose to take training at Regional Education Centers, local training facilities, or at the customer's site. Most courses blend workbook, video, and computer-based formats in order to reduce training costs as well as improve training productivity.



Large-Systems Service Vendor Comparative Tables



Large-Systems Service Vendor Comparative Tables

EXHIBIT III-1

LARGE-SYSTEM VENDOR REVENUE ANALYSIS

Company	Total Company Revenues (\$ Millions)	Percent Growth 1986-1987	Service Revenue (\$ Millions)	Percent Growth 1986-1987
Amdahl	1,505	56	271	23
CDC	3,667		400	0
Honeywell Bull	2,059	**	515	**
IBM	54,217	6	7,691	4
NAS	700		170	
NCR	5,641	14	1,952	13
Unisys			2,200	

* * New company formed 1987.

EXHIBIT III-2

LARGE-SYSTEM VENDOR SERVICE REVENUE ANALYSIS

Company	Total Service Revenue (\$ Millions)	Total Service Employees (U.S. only)	Total FEs
Amdahl	270	856	410
CDC	400 [†]	*	*
Honeywell Bull	515	2,800	*
IBM	7,691	27,000	18,000
NAS	170 [†]	950	500
NCR	1,952	10,000	6,000
Unisys	2,200	*	*

Note: All revenue figures are consolidated.

* Company did not respond.

† INPUT Estimate

EXHIBIT III-3

LARGE-SYSTEM VENDOR CONTRACT COVERAGE

Company	Standard Coverage (Hours/Days)				
	24/7	24/5	9/5	11/5	Other
Amdahl	X				
CDC				X	
Honeywell Bull					10/5
IBM	X				
NAS	X				
NCR			X		
Unisys			X		

EXHIBIT III-4

LARGE-SYSTEM VENDOR SERVICE EXCLUSIONS

Company	Billable Exclusions				
	Customer Error	Product Not under Contract	Software Problem	Alter./ Attach.	Act of God
Amdahl				X	X
CDC	X	X	X	X	X
Honeywell Bull	*	*	*	*	*
IBM	X	X		X	X
NAS		X		X	X
NCR		X		X	X
Unisys	X	X	X	X	X

* Company did not respond.

EXHIBIT III-5

LARGE-SYSTEM VENDOR HOURLY RATE

Company	Hourly Rate			
	M-F 8 a.m - 5 p.m.	M-F After 5 p.m.	Saturday	Sunday & Holidays
Amdahl	\$262 *	\$301	\$301	\$301
CDC	180	180	180	180
Honeywell Bull	159	175	175	175
IBM	262	301	301	301
NAS	259	310	310	310
NCR	156	203	203	203
Unisys	175	195	195	195

* For exclusions only

EXHIBIT III-6

LARGE-SYSTEM VENDOR DISCOUNTS—MULTIYEAR AND PREPAY

Company	Discounts Available					
	Multiyear			Prepayment		
	1st Yr	2nd Yr	3rd Yr	1st Yr	2nd Yr	3rd Yr
Amdahl	X	X	X	X	X	X
CDC	X	X	X	X	X	X
Honeywell Bull	*	*	*	*	*	*
IBM		12-25**	17-30**			
NAS	X	X	X	X	X	X
NCR	X	X	X	X	X	X
Unisys						

X Provides discount, would not divulge discount.

* Company did not respond.

** Includes call screening.

EXHIBIT III-7

LARGE-SYSTEM VENDOR—OTHER DISCOUNTS OFFERED

Company	Other Discounts					
	Carry-In	Call Screens	Dollar Volume	Unit Volume	Remote Support	Deferred Response
Amdahl			X	X		
CDC	X	X	X	X	X	X
Honeywell Bull						
IBM		X	XX	XX		
NAS	X	X	X	X	X	X
NCR	X	X	X	X	X	X
Unisys	X					X

X - Provides discount, did not divulge amount

XX - PC only

EXHIBIT III-8

LARGE-SYSTEM VENDOR SOFTWARE SUPPORT

Company	Software Support				
	How Performed			How Charged	
	On-Site	Remote	Both	Bundled	Hourly (H) or Monthly (M)
Amdahl			X	X	
CDC			X	X	M
Honeywell Bull					
IBM			X	X	
NAS			X		M
NCR			X		H/M
Unisys			X	X [†]	H/M ^{††}

† Old Sperry equipment

†† Old Burroughs equipment

EXHIBIT III-9

LARGE-SYSTEM VENDOR SOFTWARE SUPPORT DISCOUNTS

Company	Software Support Discounts			
	Multi-Copies	Call Screen	Prepay	Multi-Year
Amdahl	25%	25%	X	X
CDC	4-15%	X	4%	X
Honeywell Bull				
IBM				
NAS				
NCR	X	X		
Unisys	X			

X - Offer discount, would not divulge percent.

EXHIBIT III-10

LARGE-SYSTEM VENDOR SUPPORT PROVIDED FOR OTHER EQUIPMENT

Company	Support Other Manufacturer's Products				
	Peripherals	Workstations/ Micro-computers	Midrange Systems	Large Systems	Software
Amdahl	X			X	X
CDC	X	X	X	X	X
Honeywell Bull	X	X	X		
IBM	X	X			
NAS	X	X	X	X	X
NCR	X	X	X	X	
Unisys	X	X	X		

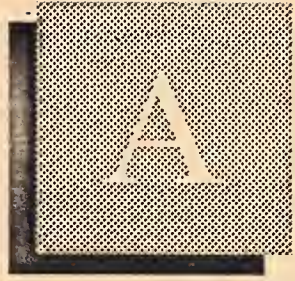
EXHIBIT III-11

LARGE-SYSTEM VENDOR SUPPORT PROVIDED TO TPM

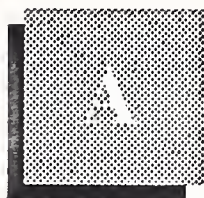
Company	Support Provided to TPMs							
	Local Access to Parts	Central Access to Parts Only	Maintenance Documentation	Engineer Change Orders	Tech. Support All Hours	Tech. Support	Training	Software Documentation
Amdahl								
CDC		X	X	X	X		X	X
Honeywell Bull								
IBM	*		X	X		X**	X	X
NAS								
NCR								
Unisys		X	X					

* Limited to major cities.

** IBM Customer Engineer will take call.



Appendix: Questionnaire



Appendix: Questionnaire

INPUT

Customer Service Program Vendor Survey Information

Manufacturer Name

TPM Name

Address

Persons Contacted

NAME

TITLE

PHONE

1. Demographics

A. Total # of Service Employees.
(Field, Hdq, Support, etc.)

B. Number of CEs, FEs

C. Number of Program Support Reps

D. Number of Total Field Personnel

E. Number of Non Field Personnel _____

F. Number of U.S. Service Locations _____

G. Number of U.S. Repair/Exc. Centers _____

H. Number of Parts Distr. Centers _____

I. What is the geographic coverage of your service?

☐ NE (ME,VT,NH,NY,MA,CT,RI,PA,NJ,MD,DE,WV,VA)

☐ SE (KY,AR,TN,NC,SC,MS,AL,LA,GA,FL)

☐ Central (MN,WI,MI,IA,IL,IN,OH,MO)

☐ SW (CA,NV,UT,AZ,CO,NM,TX,OK,KS)

☐ NW (OR,WA,ID,MT,WY,ND,SD,NE)

☐ Non-Continental (AK,HI)

J. Please check the types of products you service.

☐ Workstation/PCs

☐ Midrange Systems

☐ Large Systems

☐ Software

K. Which of the following services do you provide?

☐ Manufacturers Warranty

☐ Hardware Maintenance

☐ Software Maintenance

☐ Training for Fee

☐ Installation/Relocation

☐ Fourth-Party Maintenance

☐ Conversion/Upgrade

☐ Refurbishment

L. If you are a third party, please list the principal products that you service:

	MANUFACTURER	PRODUCT TYPE	MODEL #(S)
EX:	IBM	TERMINALS	3270
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____

2. Revenue

A. Total Annual Service Revenue _____

B. % of Total Revenue from Software Support _____

C. % of Total Revenue from Professional Support _____

D. % of Total Revenue from Education Fees _____

E. % Growth of Total Revenue Last Year _____

3. Growth Opportunities

Please give us your best estimate of the probable revenue growth rates for each of the following major services.

Hardware Maintenance _____%

Third Party Maintenance _____%

Software Support _____%

Professional Services _____%

Education/Training Fees _____%

4. Major Service Related Problems

A. What do you consider the major service related problem that your company faces right now? _____

B. What do you see as the major service related problem in the next 2 to 3 years?

5. Standard/Base On Site Hardware M/A

A. Hours of Coverage

24 hrs/ 7 days/week _____

24 hrs/5 days/week _____

9 hrs/5 days/week _____

11 hrs/5 days/week _____

Other (Please Describe) _____

B. Billable Exclusions

Customer Error	YES <input type="checkbox"/>	NO <input type="checkbox"/>
Product Not Under M/A (PD)	YES <input type="checkbox"/>	NO <input type="checkbox"/>
Software Problem	YES <input type="checkbox"/>	NO <input type="checkbox"/>
Alterations/Attach Damage	YES <input type="checkbox"/>	NO <input type="checkbox"/>
Lightning/Flood Damage	YES <input type="checkbox"/>	NO <input type="checkbox"/>

C. Response Time

Commitment/Guarantee	YES <input type="checkbox"/>	NO <input type="checkbox"/>
Objective	YES <input type="checkbox"/>	NO <input type="checkbox"/>

RESPONSE TIME

Workstation/PC Hours _____

Midrange Hours _____

Large System Hours _____

D. Travel Time/Expense Exclusions
(i.e., Time & Expense Billable)

No Exclusions _____

Over 25 Miles from Service Office _____

Over 50 Miles from Service Office _____

Over 75 Miles from Service Office _____

E. Price Protection
If YES, for How Long

YES ☐

NO ☐

F. Hourly Rates for Exclusions and Outside Hours

	Workstation/PC	Midrange	Large
Business Hrs M-F	_____	_____	_____
After Hours M-F	_____	_____	_____
Saturday	_____	_____	_____
Sunday/Holiday	_____	_____	_____

G. Discounts Available

	YES	NO	1 YR %	2 YR %	3YR %
Multi Year	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
Prepay	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____

	YES	NO	%	TO	%
Carry In	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
Call Screening	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
Dollar Volume	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
Unit Volume	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
Performance	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
Deferred Resp.	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
Remote Support	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____

In addition to the discounts above do you also negotiate discounts with individual customers?

YES ☐

NO ☐

If YES, what types are usually negotiated?

H. For customers not under contract, what are your standard hourly rates during normal business hours Monday through Friday?

Workstation/PCs	_____
Midrange Systems	_____
Large Systems	_____
Software Support	_____

I. Do you have a minimum for hourly service?

1 Hour	_____
2 Hour	_____
None	_____

J. Sales/Marketing

Please select which of the following best describes how the sales/marketing function is handled in your company?

Product Sales Responsibility	_____
Service Responsibility	_____
Joint Responsibility	_____

IF A SERVICE RESPONSIBILITY,	
Are full time sales reps used?	_____
Or is it a responsibility of the service manager?	_____

Are incentives provided to the customer engineers to sell service? _____

K. If you are the service organization of a hardware or software vendors, do you support or maintain products not manufactured or marketed by your company?

YES ☐
 NO ☐
 N/A ☐

If YES please check the categories of products that you support.

Workstations/PCs	<input type="checkbox"/>
Midrange Systems	<input type="checkbox"/>
Large Systems	<input type="checkbox"/>
Software	<input type="checkbox"/>

L. Software Support

If you are the service organization of a vendor who markets software, do you support it?

YES ☐
NO ☐

If YES

What is the nature of this support?

On Site ☐
Remote ☐
Both ☐

Is this support bundled with the license fee for the software?

YES ☐
NO ☐

If NO

Do you charge a monthly fee for this service or is it only available on an hourly fee basis?

Monthly Fee ☐
Hourly ☐
Both ☐

Do you offer any of the following discounts for software support?

Multiple Copies	<input type="checkbox"/>	_____ % TO _____ %
Call Screening	<input type="checkbox"/>	_____ % TO _____ %
Prepayment	<input type="checkbox"/>	_____ % TO _____ %
Multiyear	<input type="checkbox"/>	_____ % TO _____ %

If you are a third party organization do you offer a software support service?

YES ☐
NO ☐

If YES

What is the nature of this support?

On Site ☐
Remote ☐
Both ☐

Do you charge a monthly fee for this service or is it only available on an hourly fee basis?

Monthly Fee ☐
Hourly Fee ☐
Both ☐

Do you offer any of the following discounts for software support?

Multi Copies	<input type="checkbox"/>	_____ % TO _____ %
Call Screening	<input type="checkbox"/>	_____ % TO _____ %
Prepayment	<input type="checkbox"/>	_____ % TO _____ %
Multi Year	<input type="checkbox"/>	_____ % TO _____ %

M. Third Party Support

If you are hardware or software vendor what types of support do you offer third parties?

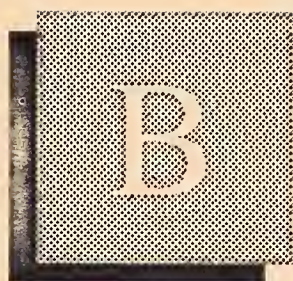
- ☐ Local Branch Parts Availability
- ☐ Parts Dist. Center Availability Only
- ☐ Maintenance Documentation
- ☐ Software Documentation
- ☐ Engineering Changes
- ☐ Technical Support All Hours
- ☐ Technical Support Prime Shift M-F
- ☐ Training

If you are a third party, which of the above items and from which vendor do you have a significant problem in obtaining?

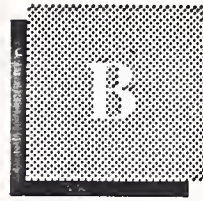
THANK YOU VERY MUCH FOR PARTICIPATING IN THIS SURVEY!!!!

INPUT

7/12/88



Appendix: Definitions



Appendix: Definitions

Applications Software - Software that performs processing to service user functions.

Artificial Intelligence - The academic discipline involving the study of the processes by which humans perceive and assimilate data (and use reasoning to process this data) for the purpose of duplicating these processes within computer systems. Also, this term refers to the computer systems that accomplish these duplicated processes.

BOC - Bell Operating Company.

Consulting - Includes analysis of user requirements and the development of a specific action plan to meet user service and support needs.

Dispatching - The process of allocating service resources to solve a support-related problem.

Divestiture - The action, stemming from antitrust lawsuits by the Department of Justice, which led to the breakup of AT&T and its previously owned local operating companies.

Documentation - All manuals, newsletters, and text designed to serve as reference material for the ongoing operation or repair of hardware or software.

End User - May buy a system from the hardware supplier(s) and do own programming, interfacing, and installation. Alternatively, may buy a turnkey system from a systems house or hardware integrator.

Expert Systems Applications - Applications for expert systems—a computer system based on a data base created by human authorities on a particular subject. The computer system supporting this data base contains software that permits inferences based on inquiries against the

information contained in the data base. Expert systems is often used synonymously with “knowledge-based systems,” although this latter term is considered to be broader and to include expert systems within its scope.

Engineering Change Notice (ECN) - Product changes to improve the product after it has been released to production.

Engineering Change Order (ECO) - The follow-up to ECNs that include parts and a bill of material to effect the change in hardware.

Escalation - The process of increasing the level of support when and if the field engineer cannot correct a hardware or software problem within a prescribed amount of time, usually two to four hours for hardware.

Fiber Optics - A transmission medium which uses light waves.

Field Engineer (FE) - For the purpose of this study, field engineer, customer engineer, service person, and maintenance person were used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

Field Service Management System (FSMS) - A specialized application program that automates some (if not all) of the following activities of a field service organization: call handling, dispatching, parts inventory and tracking, billing, efficiency reporting, and other functions. Ideally, the system accesses one data base from which each function can use and modify data.

Hardware Integrator - Develops system interface electronics and controllers for the CPU, sensors, peripherals, and all other ancillary hardware components. May also develop control system software in addition to installing the entire system at the end-user site.

ISDN - Integrated Services Digital Network. A proposed standard for digital networks providing transport of voice, data, and image using a standard interface and twisted pair wiring.

LADT - Local Area Data Transport. Data communications provided by the BOCs within local access transport areas (LATA).

Large System - Refers to traditional mainframes including at the low end IBM 4300-like machines and at the high end IBM 308X-like machines. Large systems have a maximum word length of 32 bits and a standard configuration price of \$350,000 and higher.

Mean Time Between Failures (MTBF) - The elapsed time between hardware failures on a device or a system.

Mean Time to Repair - The elapsed time from the arrival of the field engineer on the user's site until the device is repaired and returned to the user for his utilization.

Mean Time to Respond - The elapsed time between the user placement of a service call and the arrival at the user's location of a field engineer.

Microcomputer - A microprocessor-based single- or multi-user computer system typically priced less than \$15,000. A typical configuration includes an 8- or 16-bit CPU, monitor, keyboard, two floppy disk drives, and all required cards and cables.

Minicomputer - See Small System.

Operating System Software (Systems Software) - Software that enables the computer system to perform basic functions. Systems Software, for the purposes of this report, does not include utilities or program development tools.

PBX - Private Branch Exchange. A customer premises telephone switch.

Peripherals - Includes all input, output, and storage devices, other than main memory, which are locally connected to the main processor and are not generally included in other categories, such as terminals.

Planning - Includes the development of procedures, distribution, organization, and configuration of support services. For example, capacity planning, "installation" planning.

Plug-Compatible Mainframe (PCM) - Mainframe computers that are compatible with and can execute programs on an equivalent IBM mainframe. The two major PCM vendors at this time are Amdahl and National Advanced Systems.

Professional Services - A category services including system design, custom programming, consulting, education, and facilities management.

RBOC - Regional Bell Operating Company. One of seven holding companies coordinating the activities of the BOCs.

Remote Diagnostics - Gaining access to a computer from a point physically distant from the computer in order to perform problem determination activities.

Remote Support Implementation - An extension of remote diagnostics where some level of support delivery is performed from a point physically distant from the computer. Currently, this capability is more common to software support where problems can be solved or circumvented through downline loading of new code (fixes).

Reseller - A marketing organization which buys long-distance capacity for others at wholesale rates, selling services at retail but discounted prices and profiting on the difference.

Small Business Computer - For the purpose of this study, a system which is built around a Central Processing Unit (CPU), has the ability to utilize at least 20M bytes of disk capacity, provides multiple CRT workstations, and offers business-oriented systems software support.

Small System - Refers to traditional minicomputer and superminicomputer systems ranging from a small multi-user, 16-bit system at the low end to sophisticated 32-bit machine at the high end.

Software-Defined Network - A private network which uses public network facilities and which is configurable on an as-needed basis by the user (see Virtual Private Network).

Software Engineer (SE) - The individual who responds (either on-site or via remote support) to a user's service call to repair or patch operating systems and/or applications software.

Software Products - Systems and applications packages which are sold to computer users by equipment manufacturers, independent vendors, and others. Also included are fees for work performed by the vendor to implement a package at the user's site.

Superminicomputer - See Small System.

Systems Integration - The action of a single service vendor's design, development, and implementation of a system or subsystem including integration of hardware, software, and communications facilities for a customer.

System Interruption - Any system downtime requiring an Initial Program Load (IPL).

Systems House - Integrates hardware and software into a total turnkey system to satisfy the data processing requirement of the end user. May also develop systems software products for license to end users.

T-I - Refers to a standard 1.544 megabit per second digital channel used between telephone company central offices and now used for microwave, satellite, fiber optics, or other bypass applications.

Third-Party Maintenance (TPM) - Any service provider other than the original equipment vendor.

Training - All audio, visual, and computer-based documentation, materials, and live instruction designed to educate users and support personnel in the ongoing operation or repair of hardware and software.

Turnkey System - Composed of hardware and software integrated into a total system designed to completely fulfill the processing requirements of a single application.

VSAT - Very Small Aperture Terminal. A small satellite dish system, usually using Ku-band frequencies.

Virtual Private Network - A portion of a public network dedicated to a single user.

